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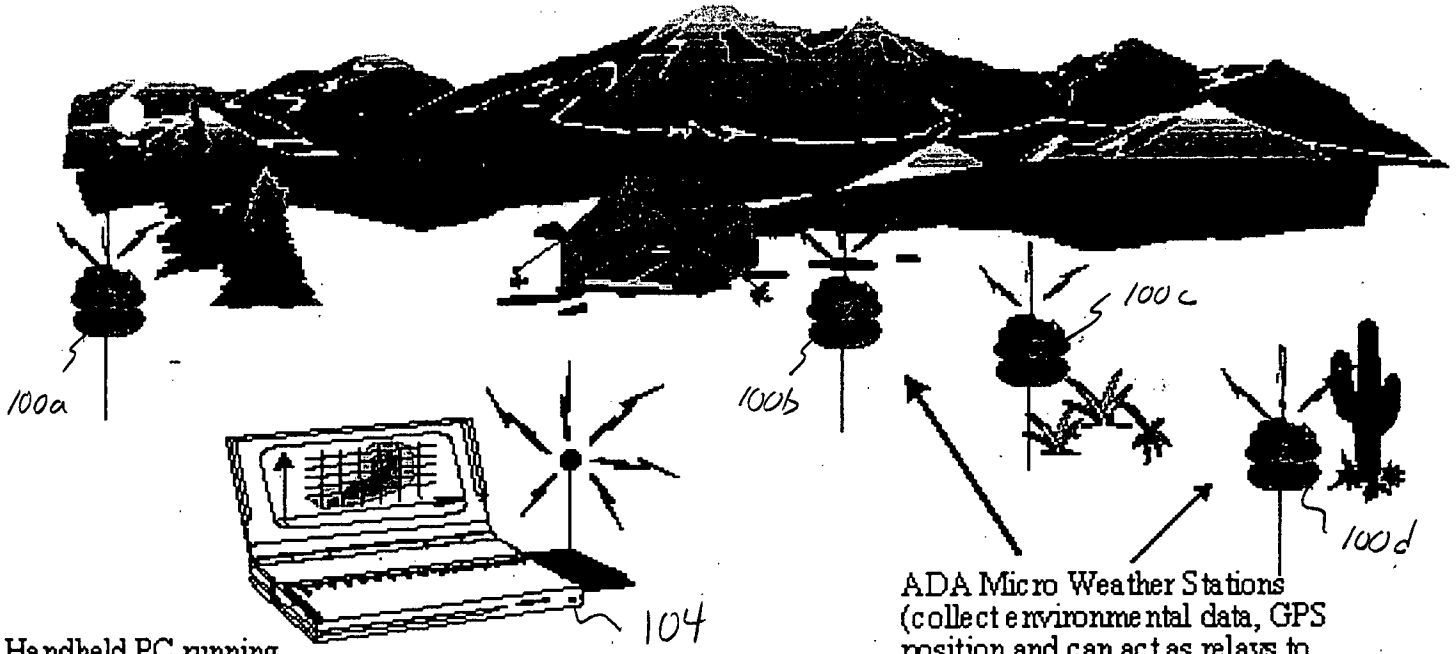

100a
100b
100c
100d
104
Handheld PC running
ADA communications software under Windows CE
ADA Micro Weather Stations
(collect environmental data, GPS
position and can act as relays to
transmit data to base station

FIG. 1

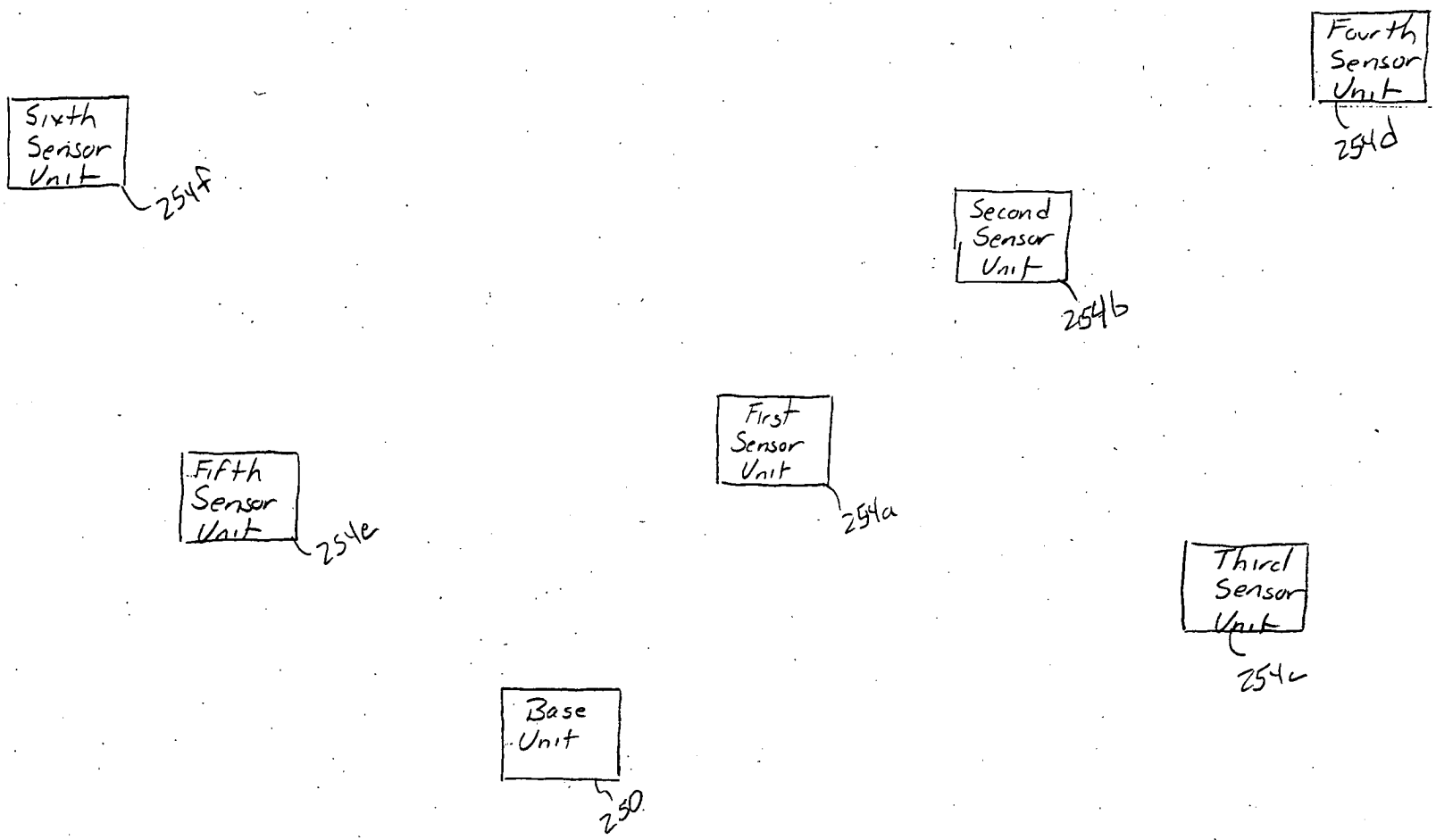
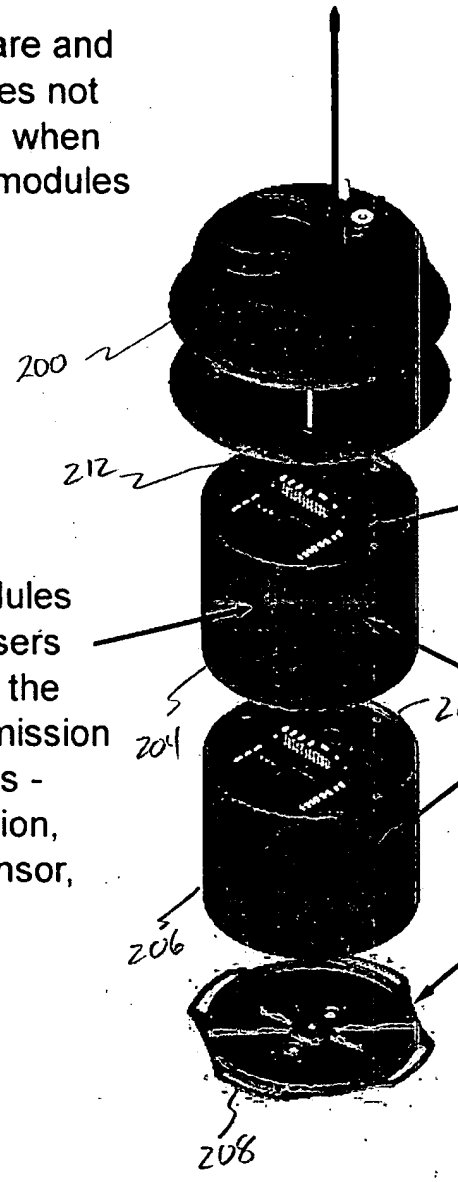

Sixth Sensor Unit
254f
Fourth Sensor Unit
254d
Second Sensor Unit
254b
First Sensor Unit
254a
Fifth Sensor Unit
254e
Third Sensor Unit
254c
Base Unit
250

FIG. 2

MSP Hardware and Firmware does not change even when new sensor modules are created

MSP Provides:
1) Environmental Measurements
2) Communications to base
3) GPS Locations

MSP Manages:
1) Total system power
2) Measurement Schedule(s)



Electronics interface between add-on instruments and the MSP.

Add-on modules allow end-users to configure the SAMS per mission requirements - CWA detection, radiation sensor, etc...

Arrangement allows for use of COTS instruments in add-on modules

Bottom plate of MSP is attached to bottom of stack of sensor modules

FIG. 3.

1—Bull's-eye level
2—Top shell
3—Incident radiation sensors
4—Ultrasonic transducer (x4)
5—Circuit board
6—Transducer mount
7—Shielded temperature sensor
8—Battery board
9—Bottom cover
10—Thumbscrew
11—Lithium-ion battery cells
12—Bottom wind deflector
13—Precision standoff
14—Upper wind deflector
15—GPS unit
16—Radio modem and antenna
17—Rain gauge

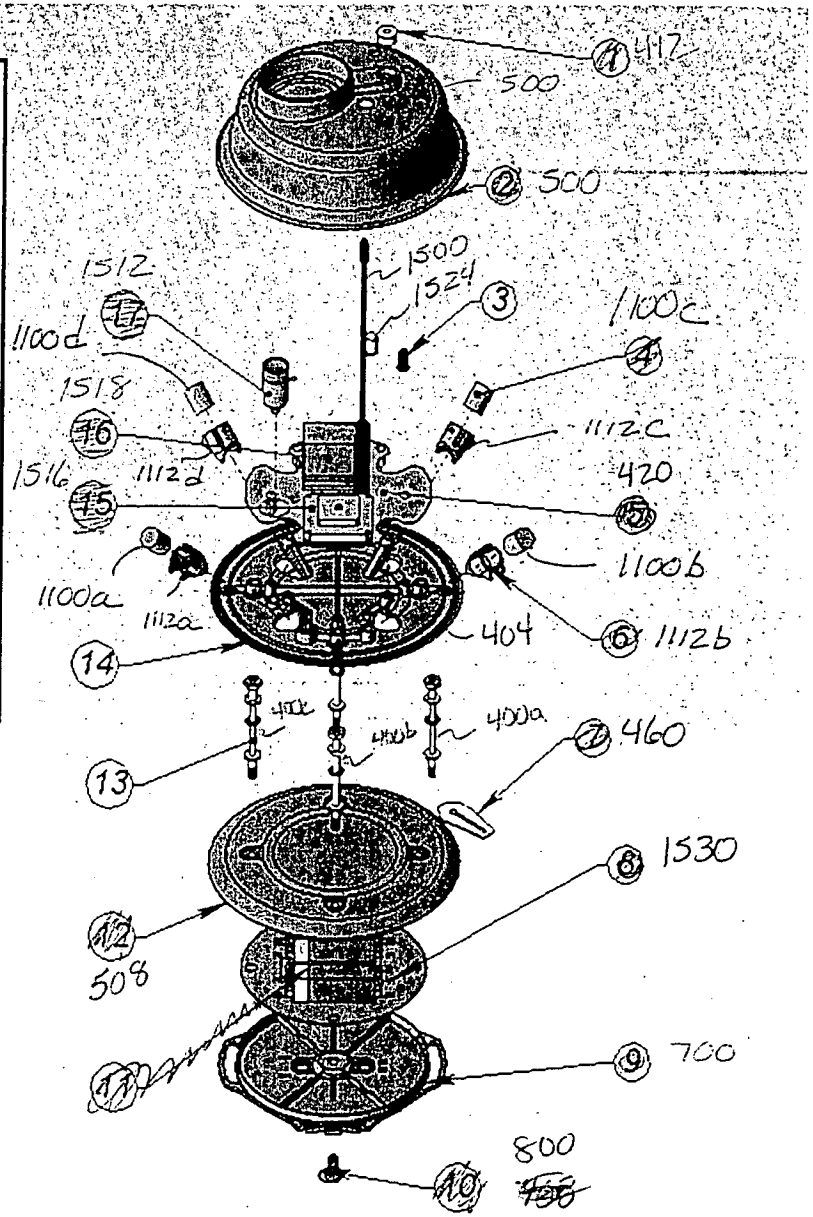


FIG. 4

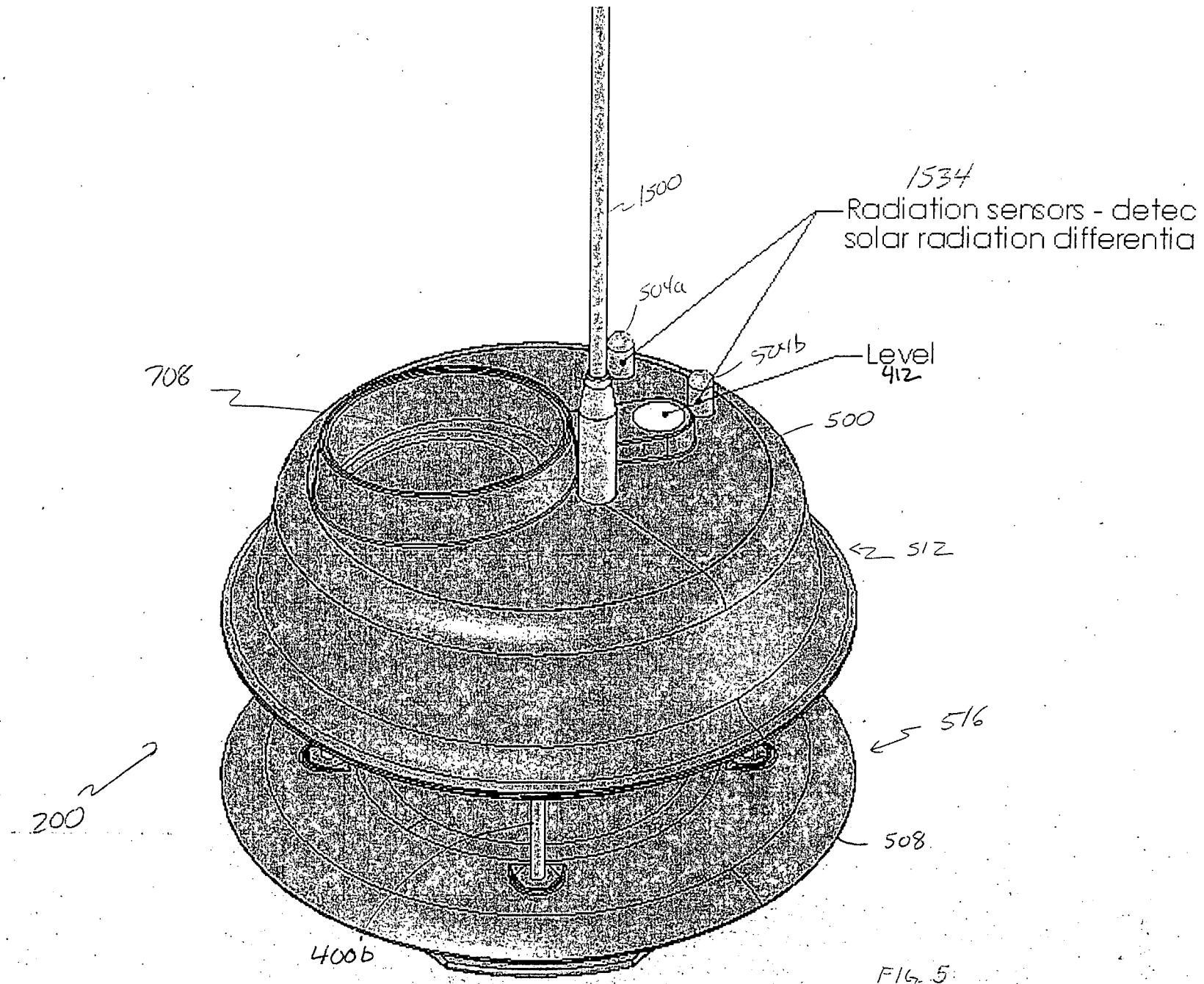

1534
Radiation sensors - detec
solar radiation differentia
1500
504a
502b
Level
412
708
500
512
516
200
508
400b

FIG. 5

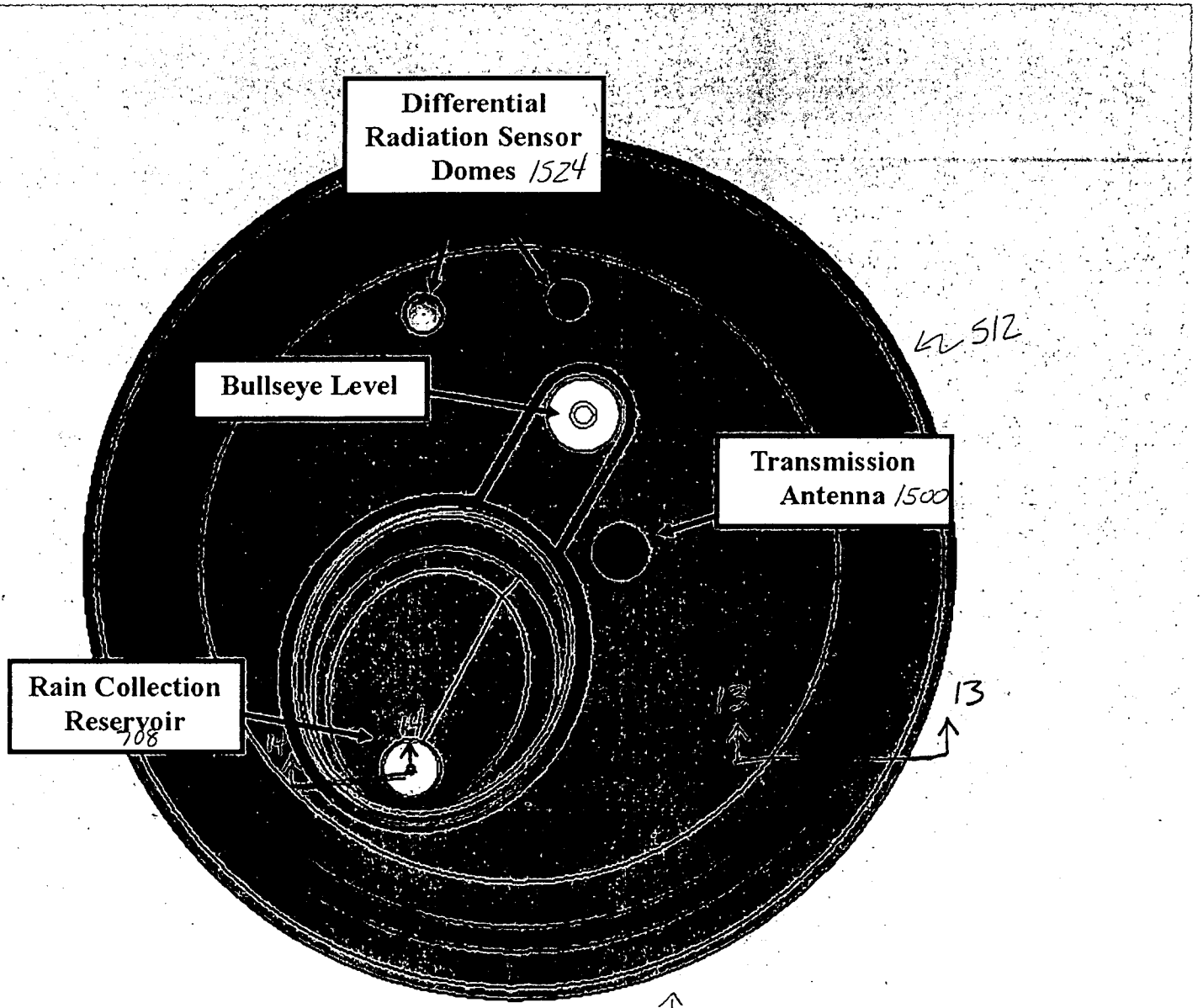

Differential Radiation Sensor Domes 1524
512
Bullseye Level
Transmission Antenna 1500
Rain Collection Reservoir 1508
13
200

FIG. 6

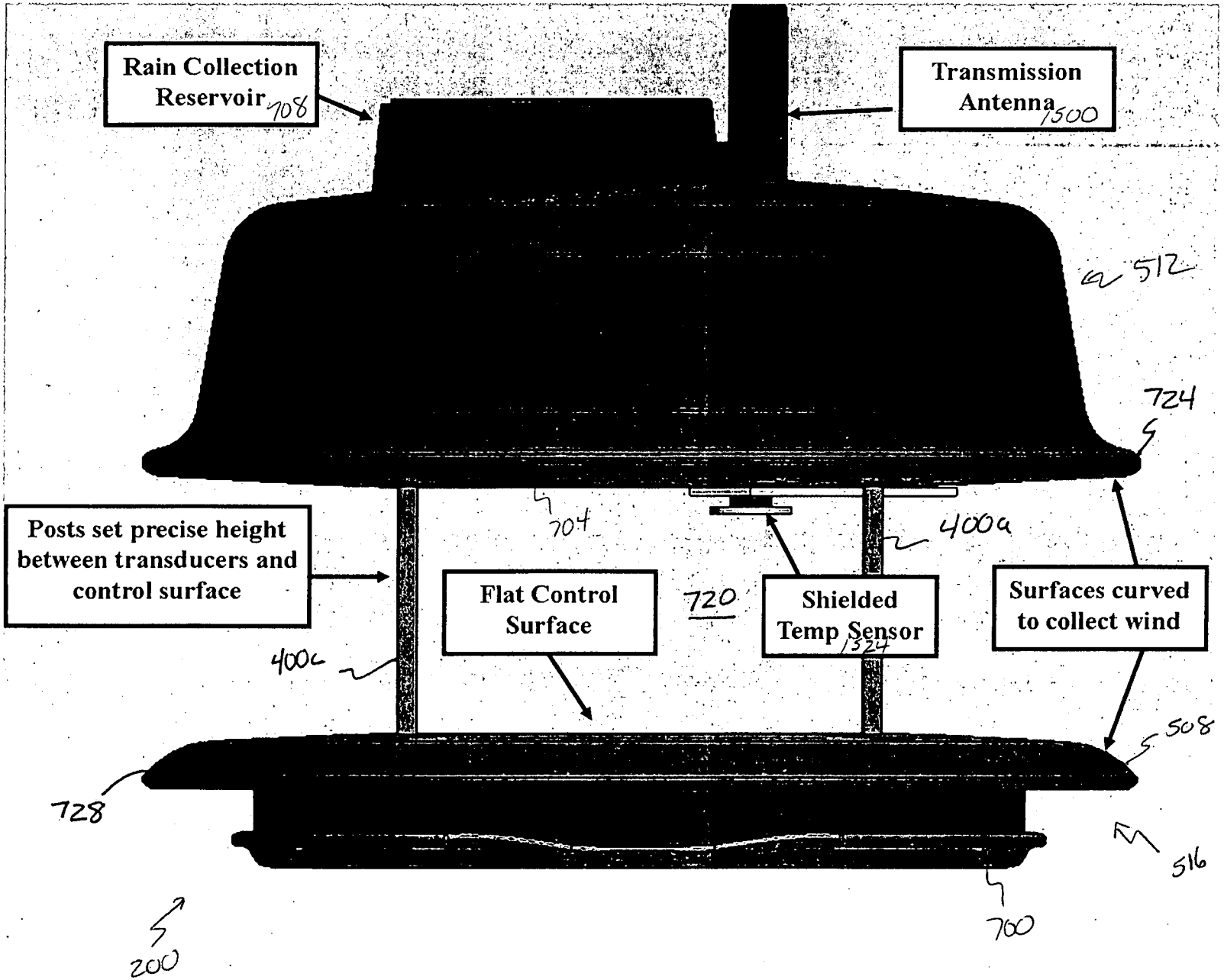

Rain Collection Reservoir
708
Transmission Antenna
1500
512
724
704
400a
Posts set precise height between transducers and control surface
Flat Control Surface
720
Shielded Temp Sensor
1324
Surfaces curved to collect wind
400c
508
728
516
700
200

FIG. 7

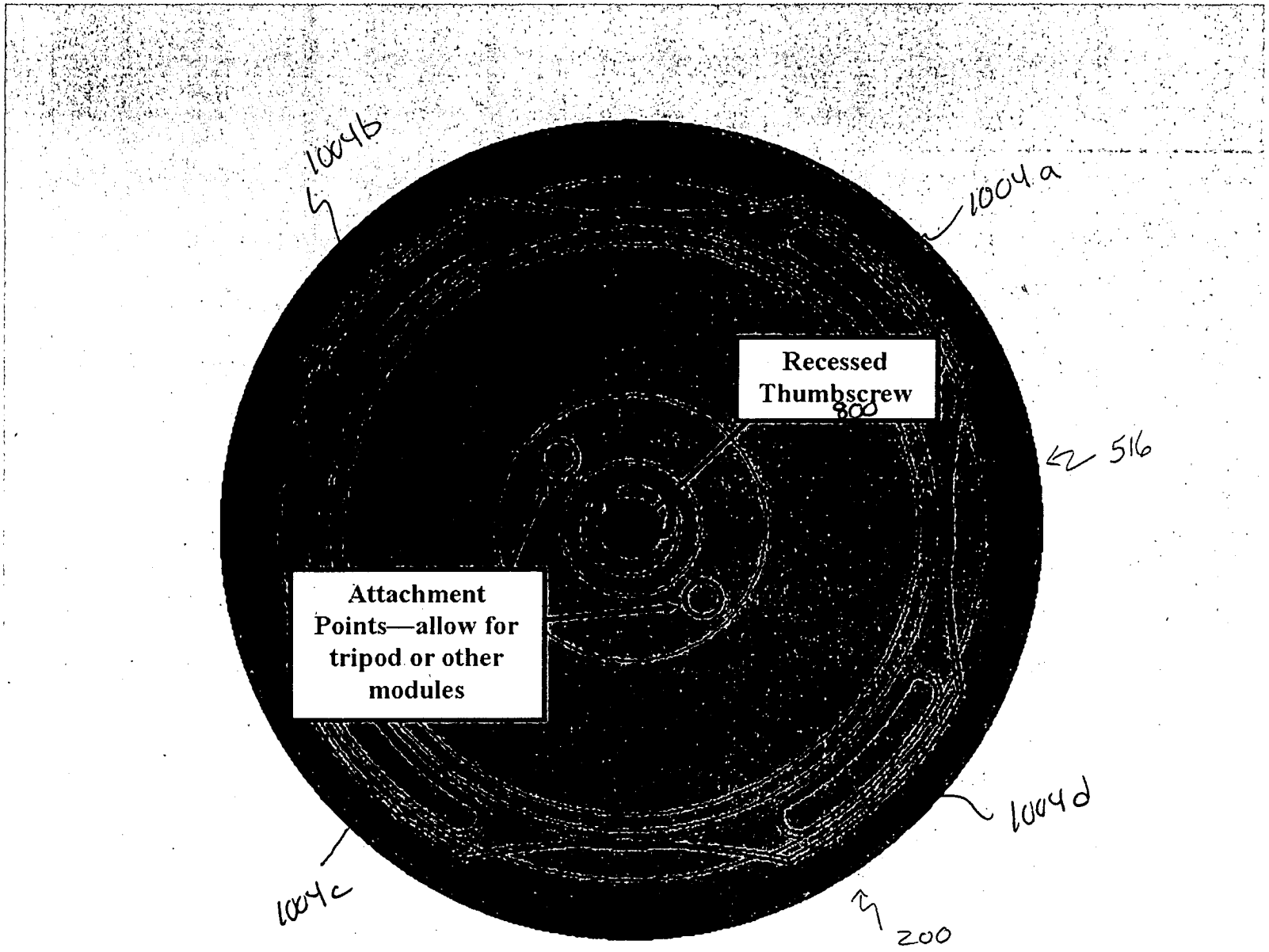

1004b
1004a
Recessed Thumbscrew
800
516
Attachment Points—allow for tripod or other modules
1004d
1004c
200

FIG. 8

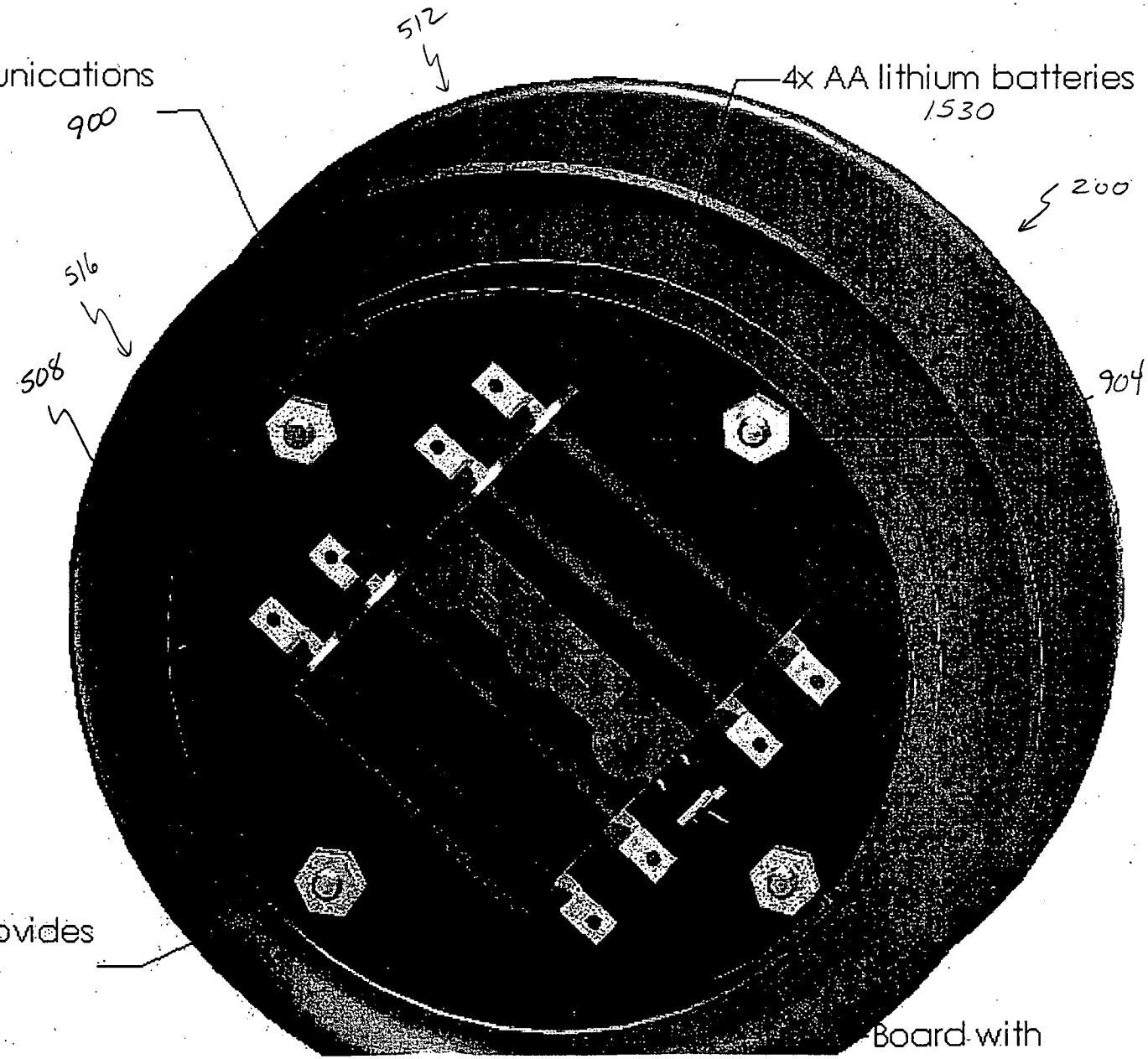

Communications port
900
512
4x AA lithium batteries
1530
200
516
508
904
Angled lip provides seal
Board with

FIG. 9

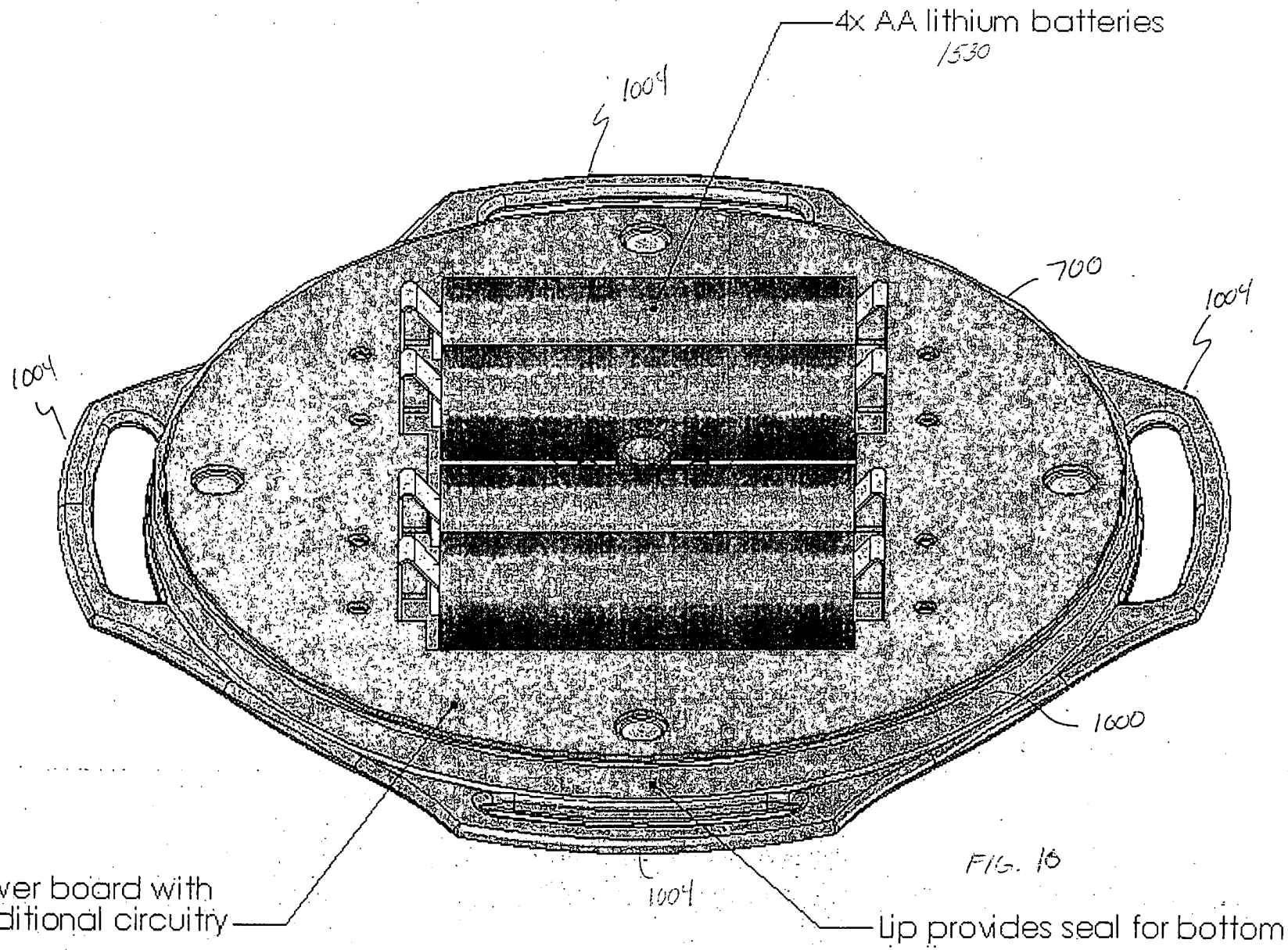

4x AA lithium batteries
1530
1004
700
1004
1004
1600
1004
Power board with additional circuitry
Lip provides seal for bottom

FIG. 16

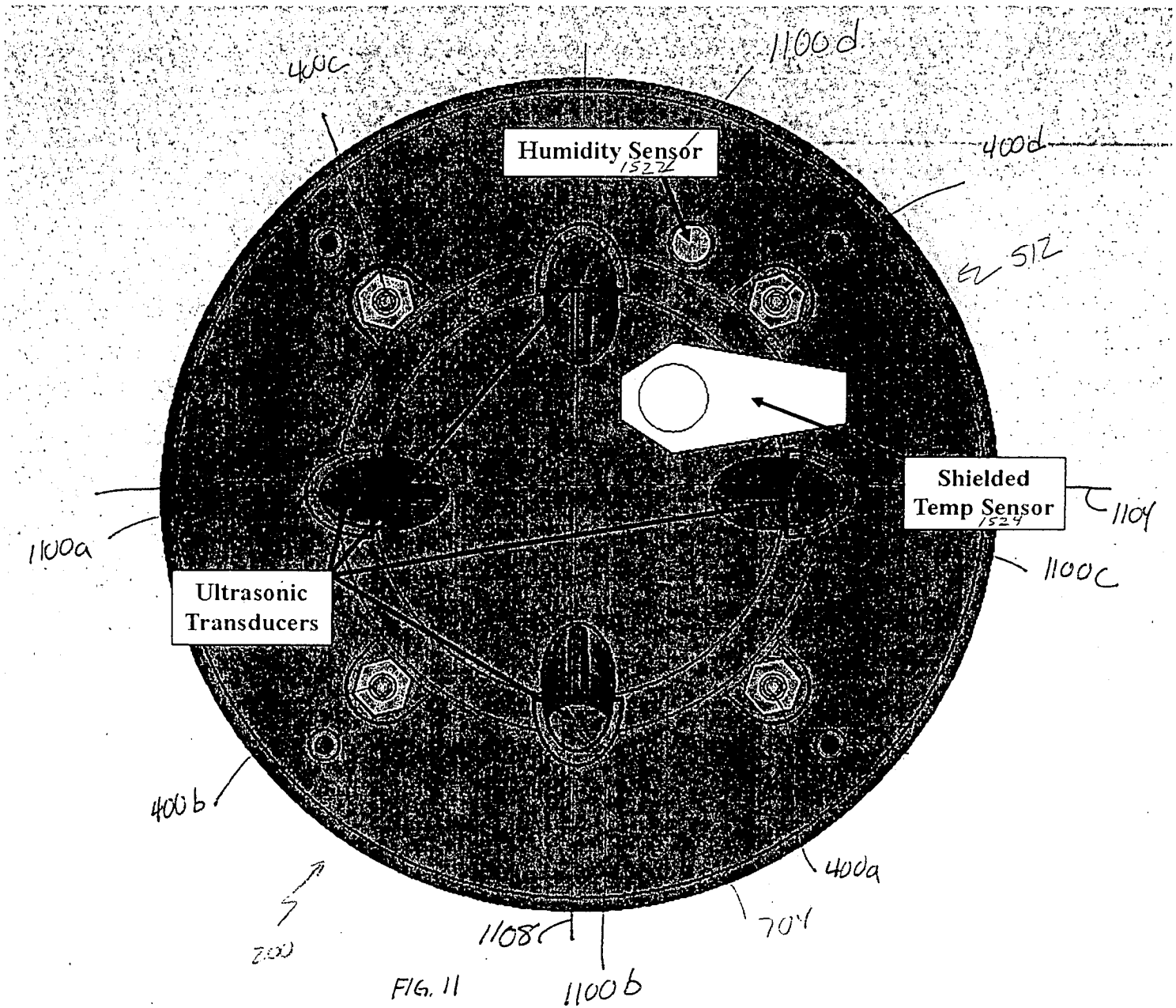

1100d
400c
Humidity Sensor
1522
400d
512
Shielded
Temp Sensor
1524
1104
1100c
1100a
Ultrasonic
Transducers
400b
400a
704
1108
1100b
200

FIG. 11

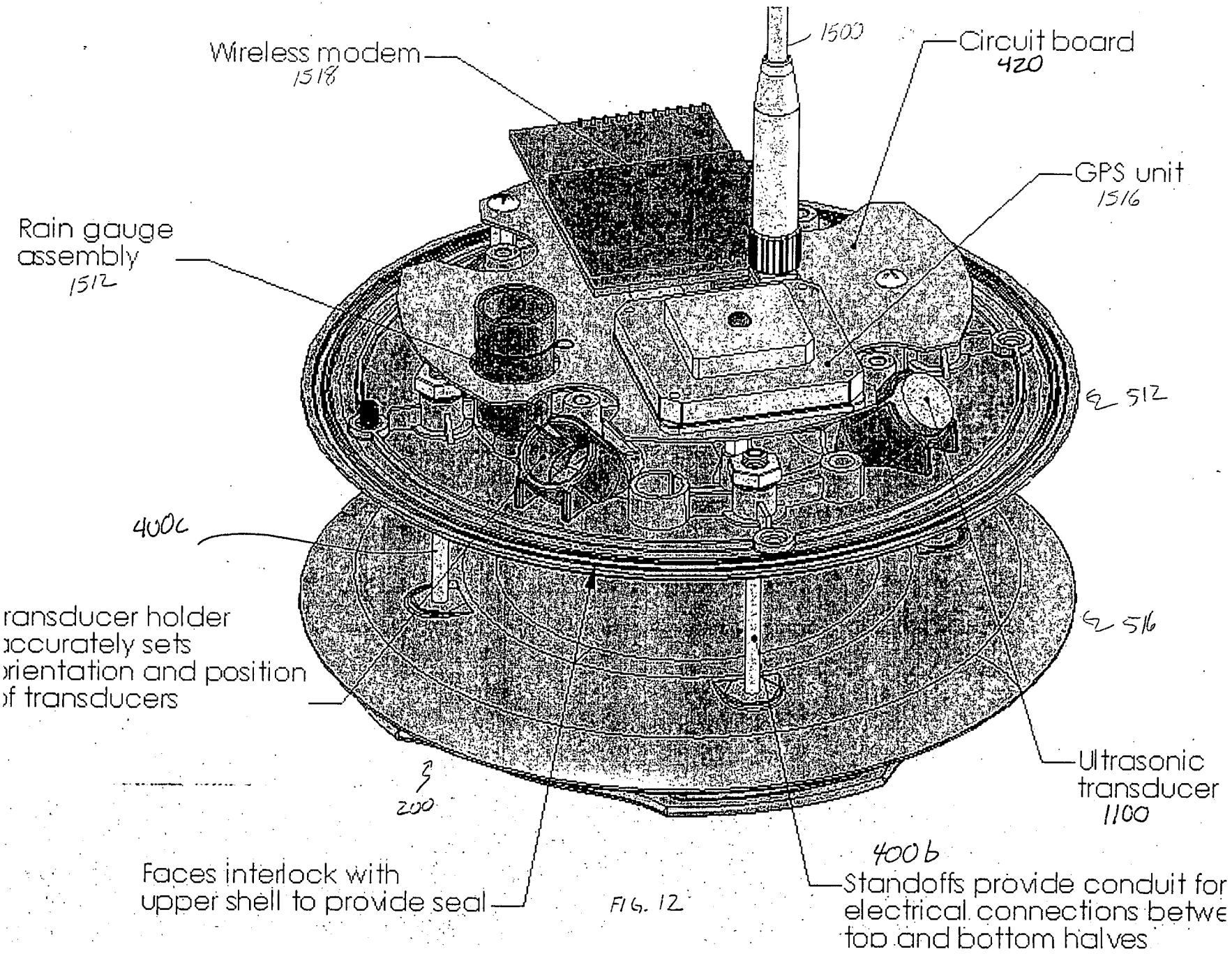

1500
Wireless modem
1518
Circuit board
420
GPS unit
1516
Rain gauge
assembly
1512
512
400c
ransducer holder
ccurately sets
rientation and position
f transducers
516
Ultrasonic
transducer
1100
200
400b
Faces interlock with
upper shell to provide seal
Standoffs provide conduit for
electrical connections betwe
top and bottom halves

FIG. 12

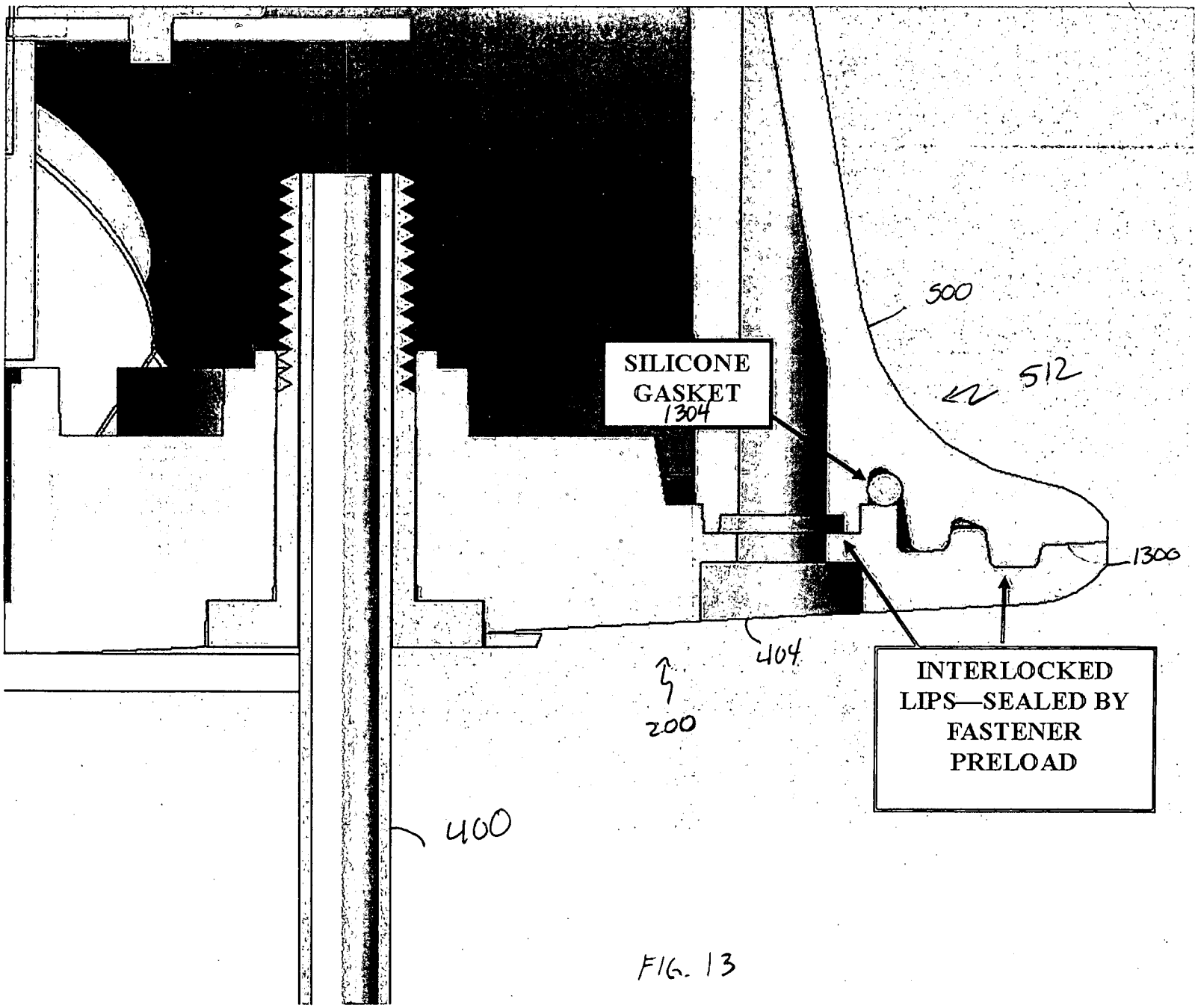

SILICONE GASKET 1304
500
512
1300
404
200
INTERLOCKED LIPS—SEALED BY FASTENER PRELOAD
400

FIG. 13

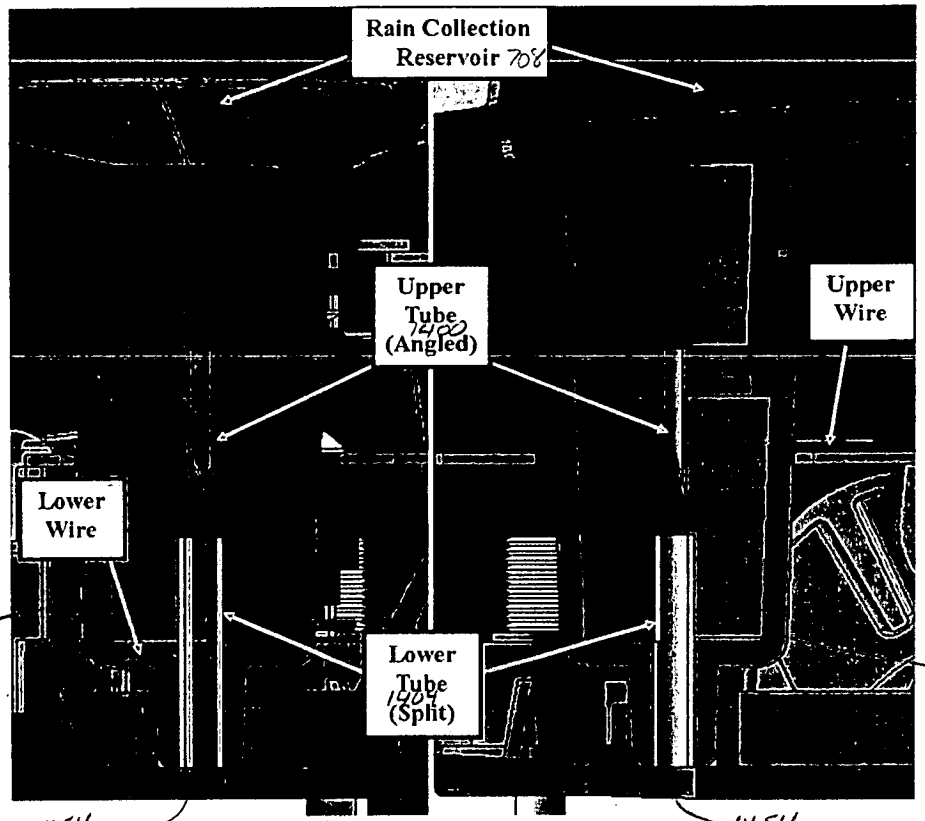
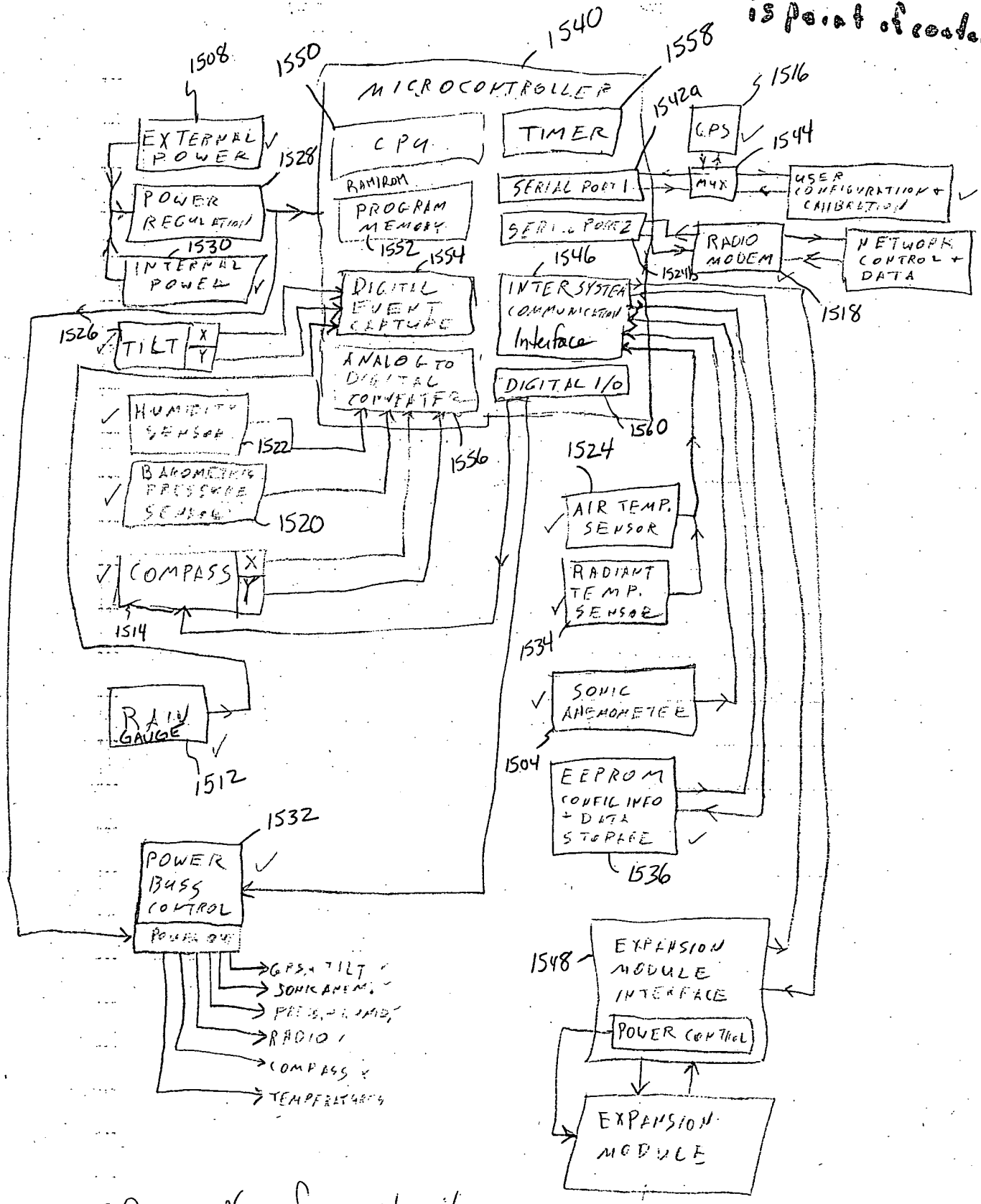


FIG. 14A

FIG. 14B

electrical flow. Mike O'Connor is point of contact



→ paragraph for each item

FIG. 15

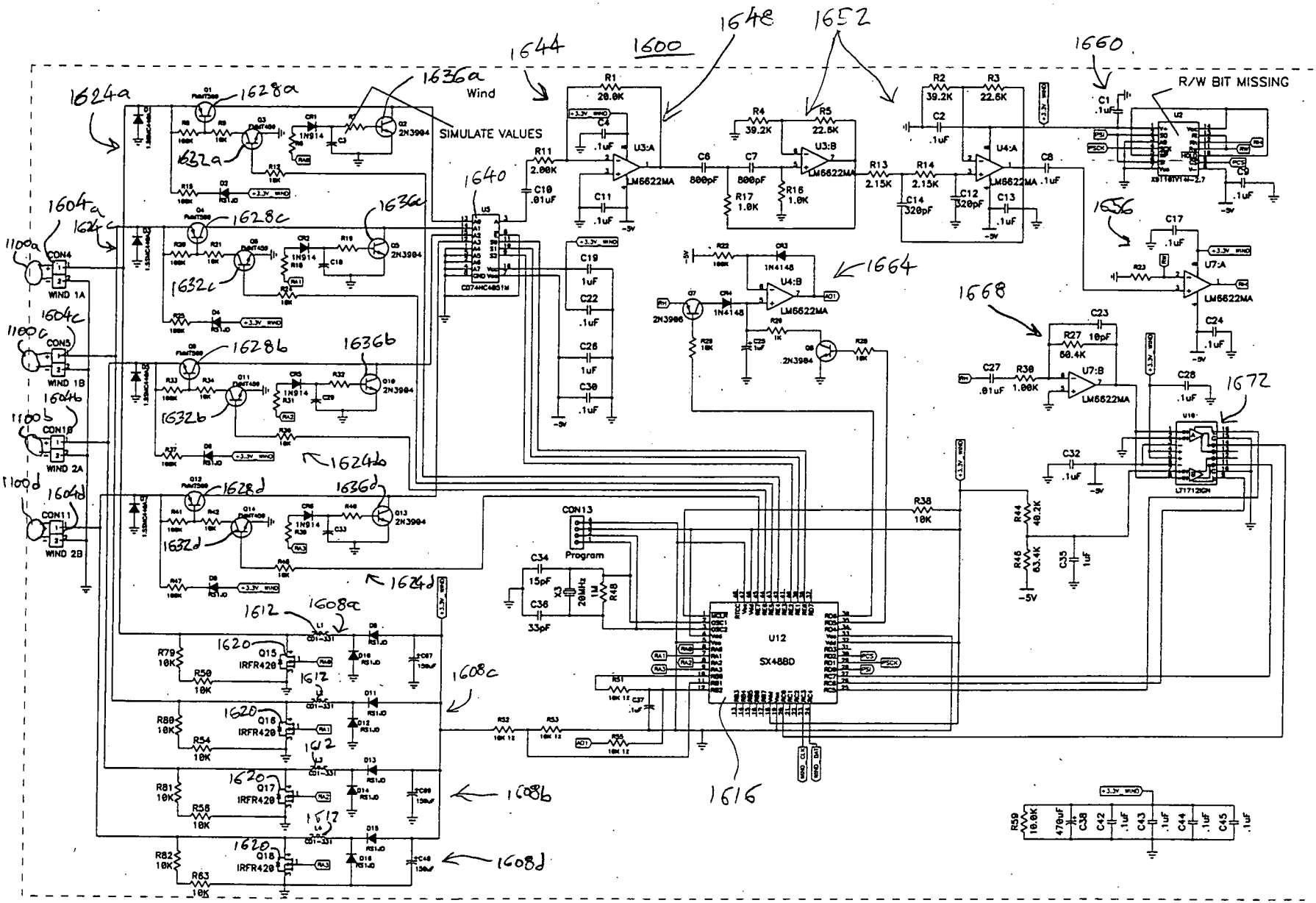

1644
1600
1648
1652
1660
1624a
1628a
1636a
Wind
SIMULATE VALUES
1632a
1640
1604a
1624c
1628c
1636c
1100a
CON4
WIND 1A
1632c
1604c
1100c
CON5
WIND 1B
1628b
1636b
1604b
1624b
1100b
CON10
WIND 2A
1628d
1636d
1604d
1624d
1100d
CON11
WIND 2B
1632d
1608a
1612
1620
Q15
IRFR420
1608c
Q16
IRFR420
1608b
Q17
IRFR420
1608d
Q18
IRFR420
1616
U12
SX48BD
CON13
Program
1664
1656
1668
1672
R/W BIT MISSING
LM6622MA
U3:A
U3:B
U4:A
U4:B
U7:A
U7:B
LT1712CN
CD74HC4051M

FIG. 16

Sensor Unit	Branch	Next Scheduled Communication	Neighbor List
1	1	1:30 PM	2 3 4
2	1	1:30 PM	1 3 4
3	1	1:30 PM	1 2 4
4	1	1:30 PM	1 2 3
⋮	⋮	⋮	⋮
N	M	3:00 PM	X Y Z

1700 1704 1708 1712

FIG. 17

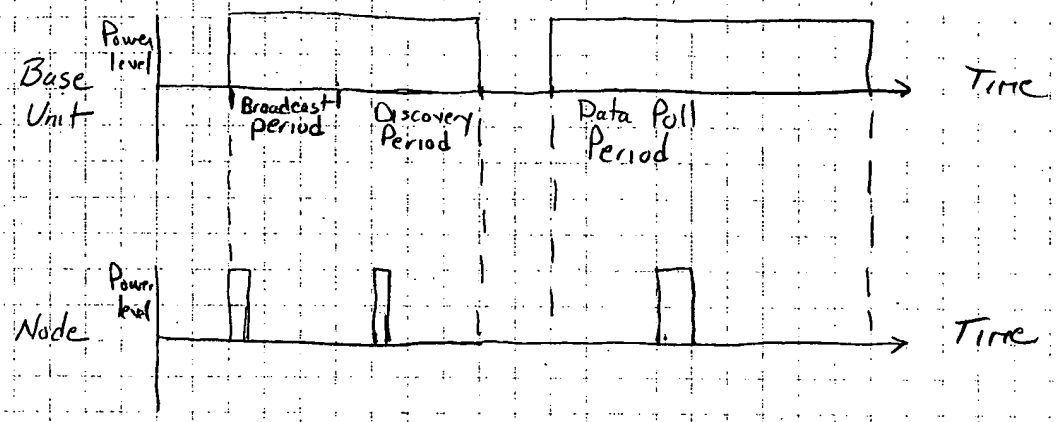

Base Unit
Power level
Broadcast period
Discovery Period
Data Poll Period
Time
Node
Power level
Time

FIG 18

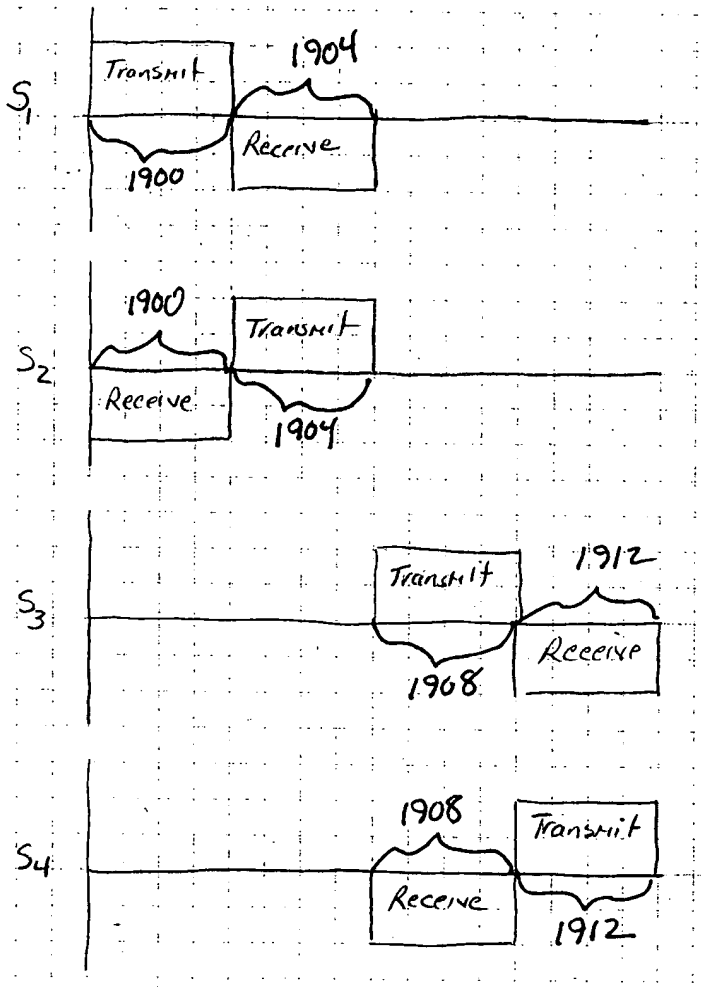

S1
Transmit
1904
Receive
1900
S2
1900
Transmit
Receive
1904
S3
Transmit
1912
Receive
1908
S4
1908
Transmit
Receive
1912

FIG. 19


1404

FIG. 20

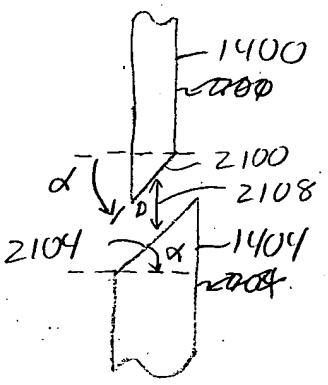


FIG. 21

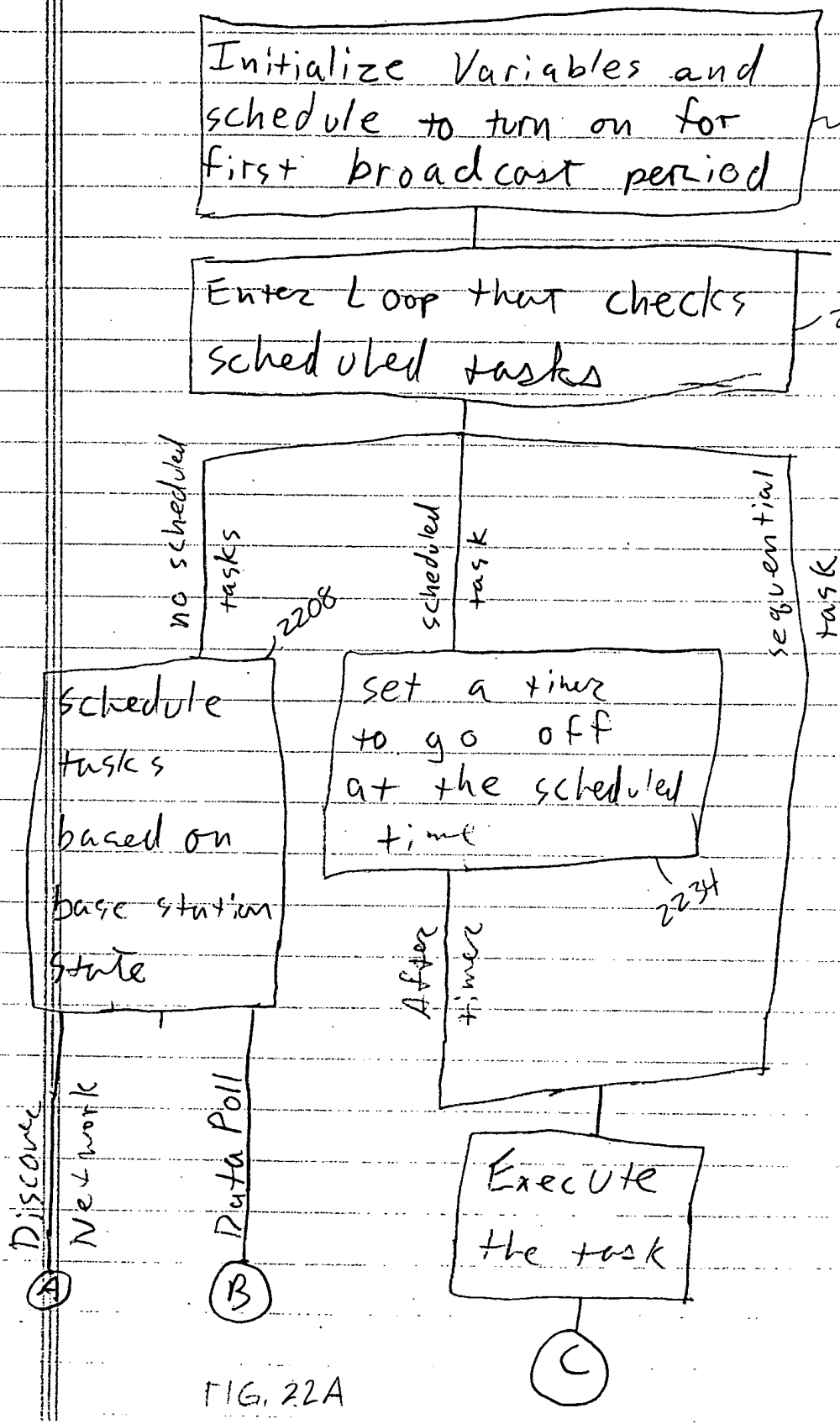

Initialize Variables and schedule to turn on for first broadcast period
2200
Enter Loop that checks scheduled tasks
2204
no scheduled tasks
2208
scheduled task
sequential task
Schedule tasks based on base station state
set a timer to go off at the scheduled time
2234
After timer
Discovery Network
Data Poll
A
B
Execute the task
C

FIG. 22A

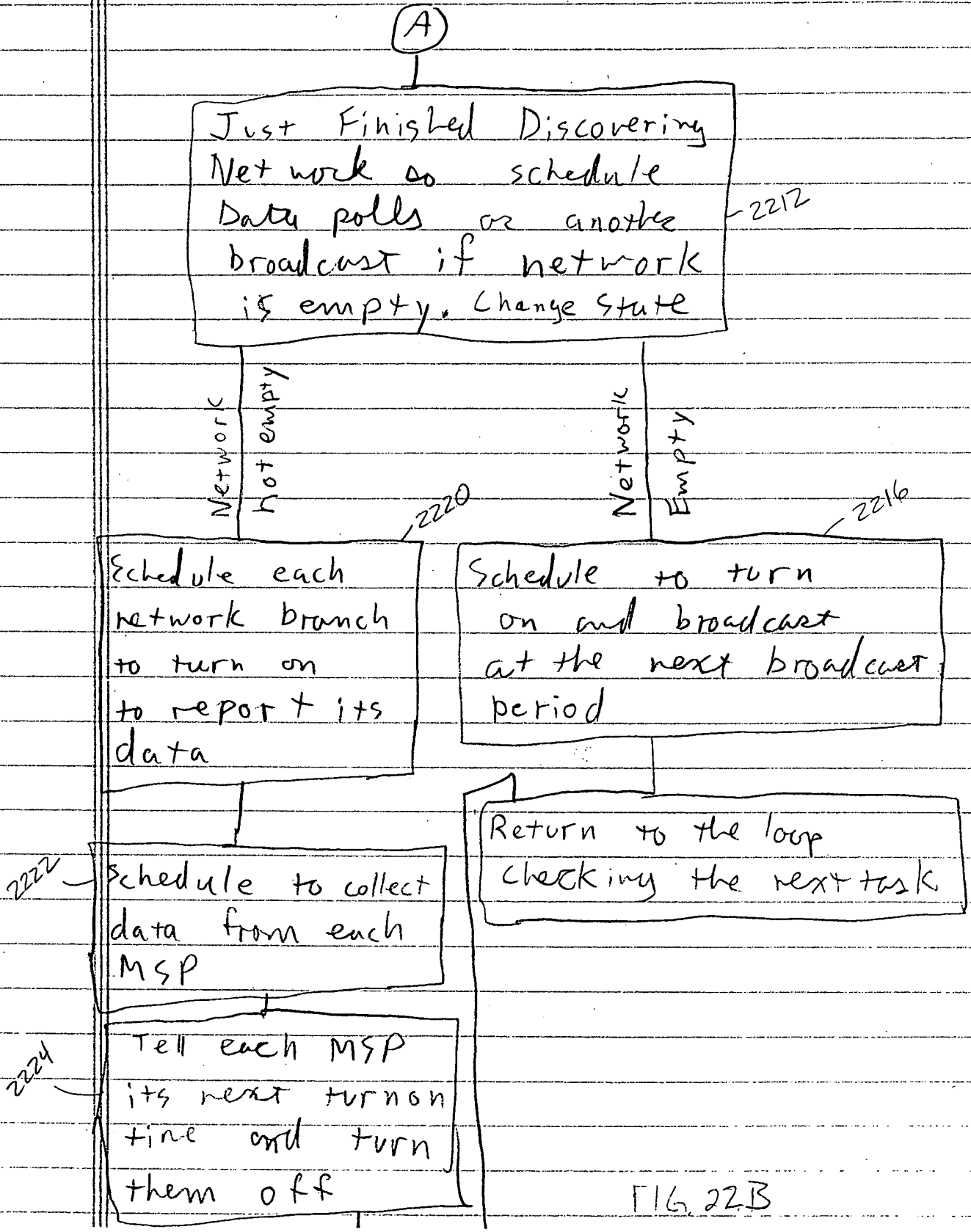

A
Just Finished Discovering Network so schedule Data polls or another broadcast if network is empty. Change State
2212
Network Not empty
Network Empty
2220
Schedule each network branch to turn on to report its data
2216
Schedule to turn on and broadcast at the next broadcast period
Return to the loop checking the next task
2222
Schedule to collect data from each MSP
2224
Tell each MSP its next turnon time and turn them off

FIG. 22B

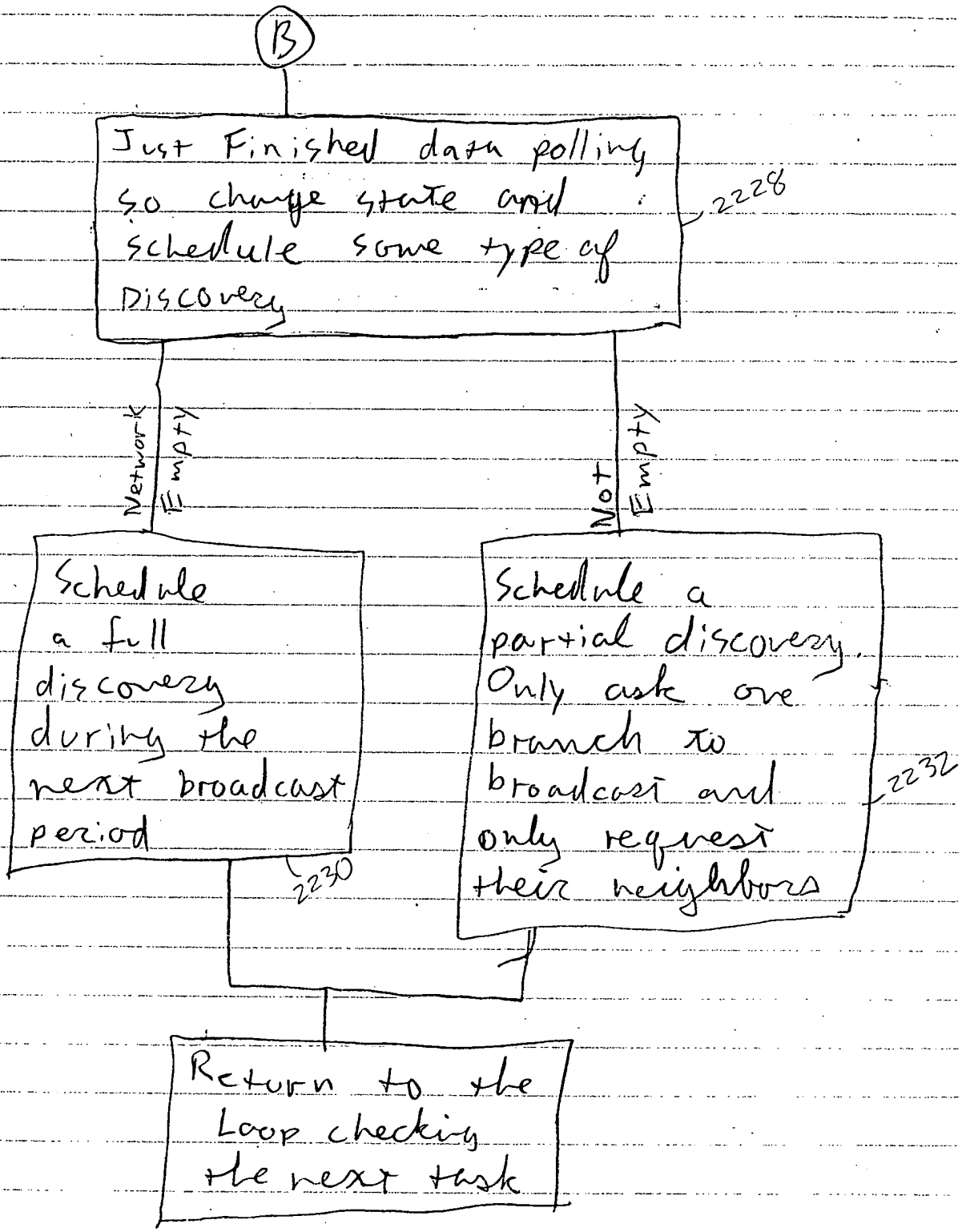

B
Just Finished data polling so change state and schedule some type of Discovery
2226
Network Empty
Not Empty
Schedule a full discovery during the next broadcast period
2230
Schedule a partial discovery. Only ask one branch to broadcast and only request their neighbors
2232
Return to the Loop checking the next task

FIG. 22C

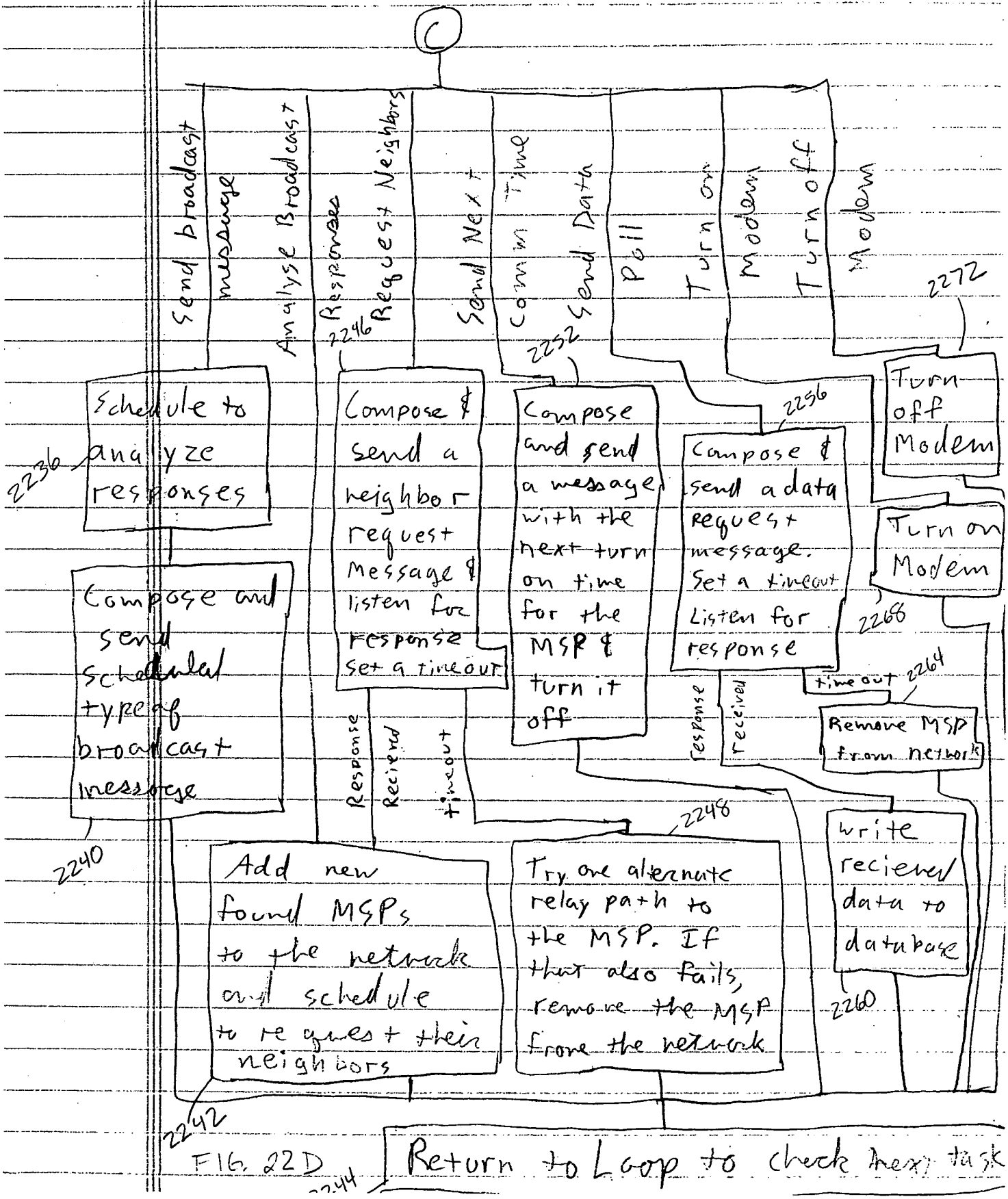

C
Send broadcast message
Analyse Broadcast Responses
Request Neighbors
Send Next
Comm Time
Send Data
Poll
Turn on Modem
Turn off Modem
2272
2246
2252
2256
2236
Schedule to analyze responses
Compose & send a neighbor request message & listen for response set a timeout
Compose and send a message with the next turn on time for the MSP & turn it off
Compose & send a data request message. Set a timeout Listen for response
Turn off Modem
Turn on Modem
2268
timeout
2264
Remove MSP from network
Response Recieved
timeout
Response Received
2240
Compose and send scheduled type of broadcast message
2248
Add new found MSPs to the network and schedule to request their neighbors
Try one alternate relay path to the MSP. If that also fails, remove the MSP from the network
write recieved data to database
2260
2242
Return to Loop to check next task
2244

FIG. 22D

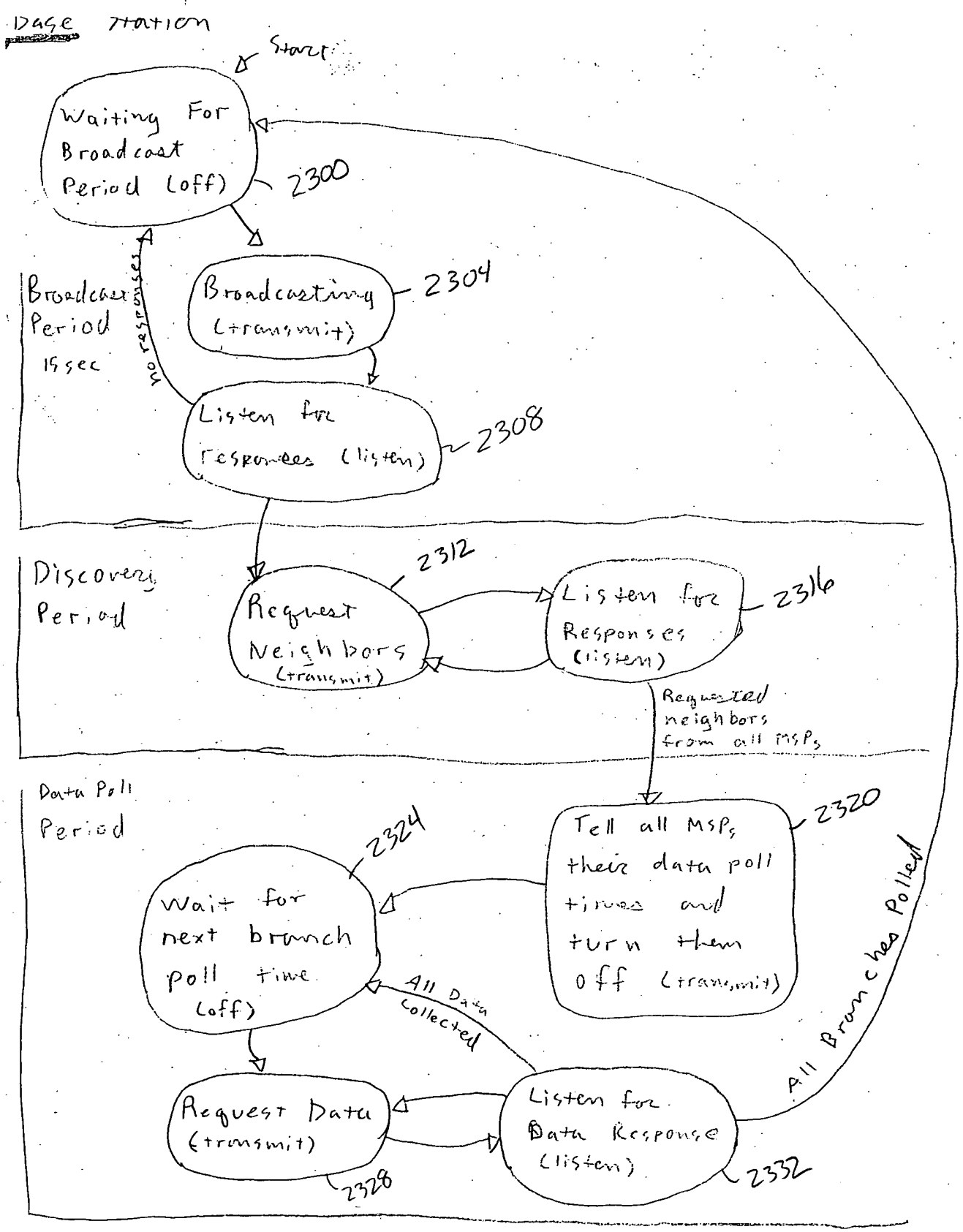

Base Station
Start
Waiting For Broadcast Period (off)
2300
Broadcast Period 15 sec
Broadcasting (transmit)
2304
No responses
Listen for responses (listen)
2308
Discovery Period
Request Neighbors (transmit)
2312
Listen for Responses (listen)
2316
Requested neighbors from all MSPs
Data Poll Period
Tell all MSPs their data poll times and turn them off (transmit)
2320
Wait for next branch poll time (off)
2324
All Data Collected
All Branches Polled
Request Data (transmit)
2328
Listen for Data Response (listen)
2332

FIG. 23

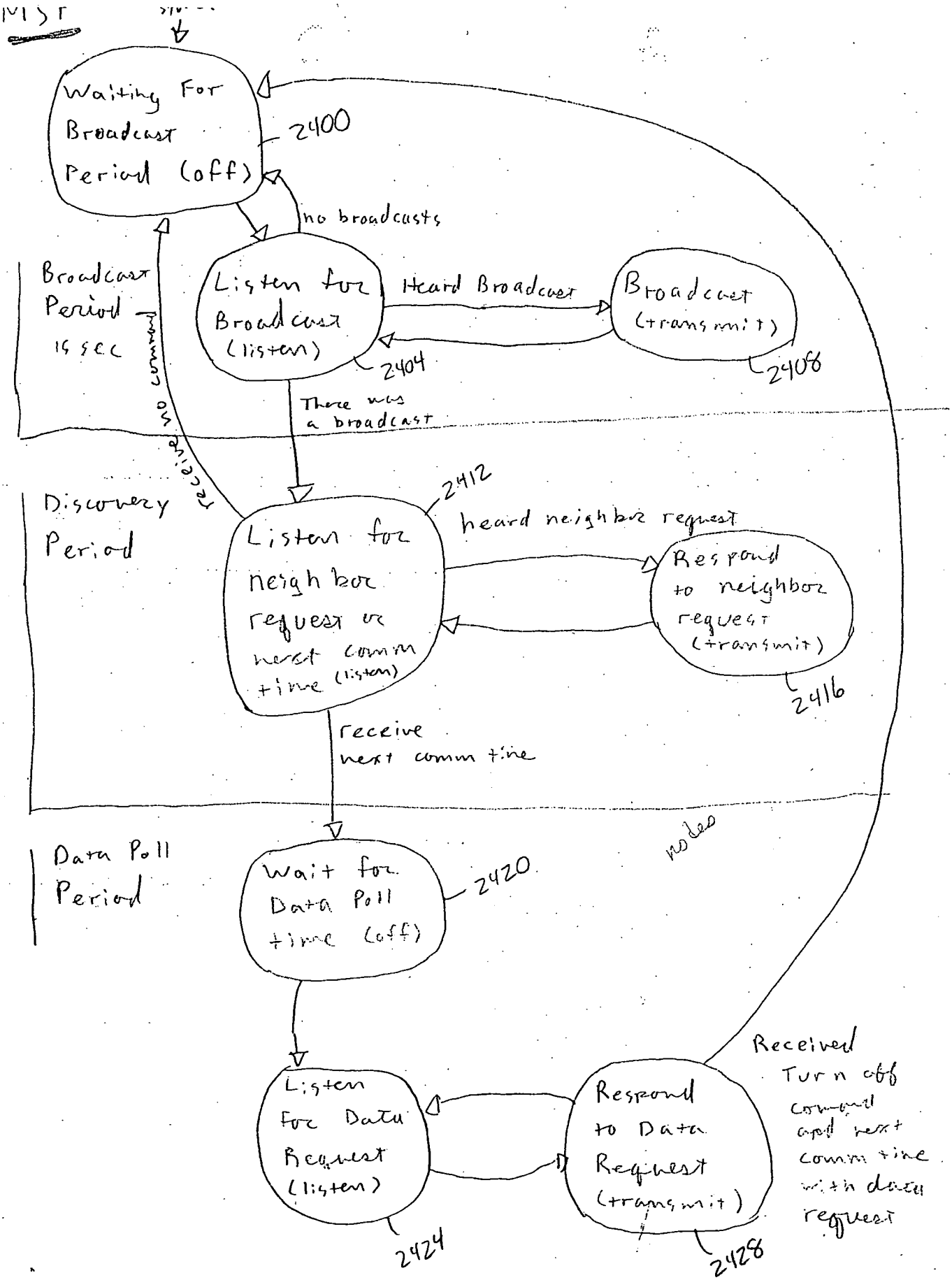

MIST
Waiting For Broadcast Period (off)
2400
no broadcasts
Broadcast Period 1 sec
Listen for Broadcast (listen)
Heard Broadcast
Broadcast (transmit)
2404
2408
no comm
There was a broadcast
Discovery Period
received
2412
heard neighbor request
Listen for neighbor request or next comm time (listen)
Respond to neighbor request (transmit)
2416
receive next comm time
no dee
Data Poll Period
Wait for Data Poll time (off)
2420
Listen For Data Request (listen)
Respond to Data Request (transmit)
Received Turn off command and next comm time with data request
2424
2428

FIG. 24